



RENEWABLE ENERGY INDUSTRY AUSTRALIA

(Based on exchange rate USD \$1 = AUD \$ 1.33)

PREPARED BY:

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SUMMARY:

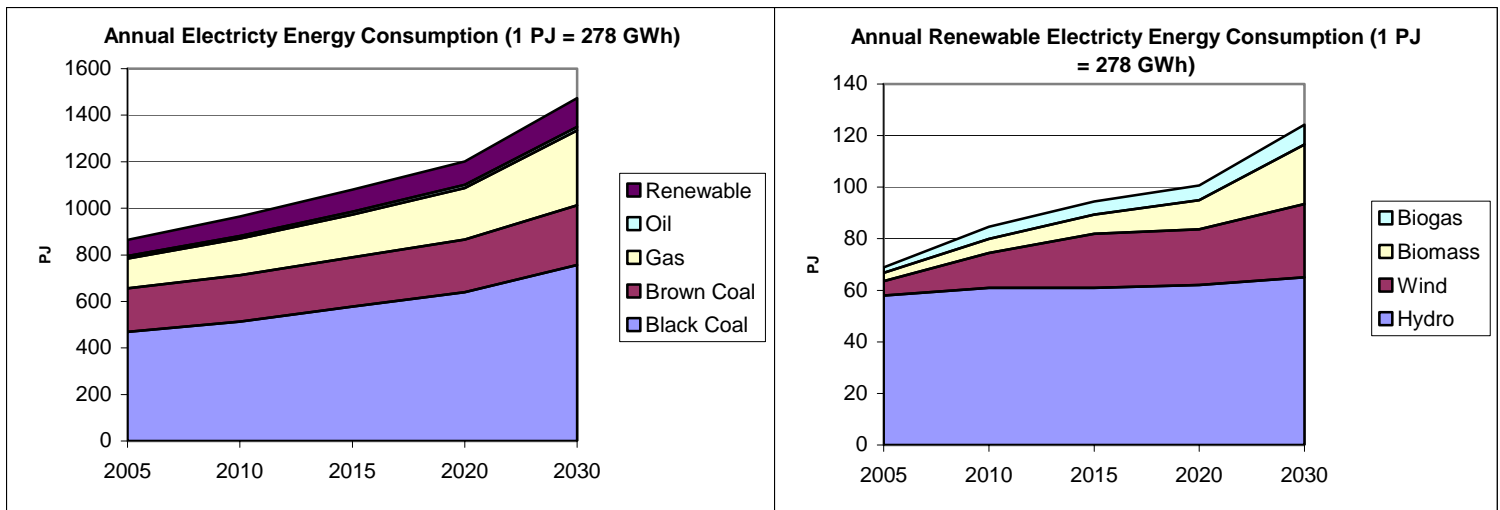
Like many countries around the world there is an increasing focus on renewable energy alternatives in Australia. While hydro electricity has been in use in Australia for around 90 years, there are significant recent developments and growth opportunities in the wind, solar and biomass segments of the renewable energy industry. Government support in terms of economic parity and incentives for R&D work are providing opportunities for Australian companies and their international partners. The key challenge for the industry is how to build a sustainable future that overcomes this financial hurdle presented by the additional cost of renewable energy over non-renewable sources. Local industry believes that growing the scale of the market and the invention/adoption of revolutionary technology should help to close this gap. Opportunities exist for US companies with innovative renewable energy solutions.

MARKET OVERVIEW:

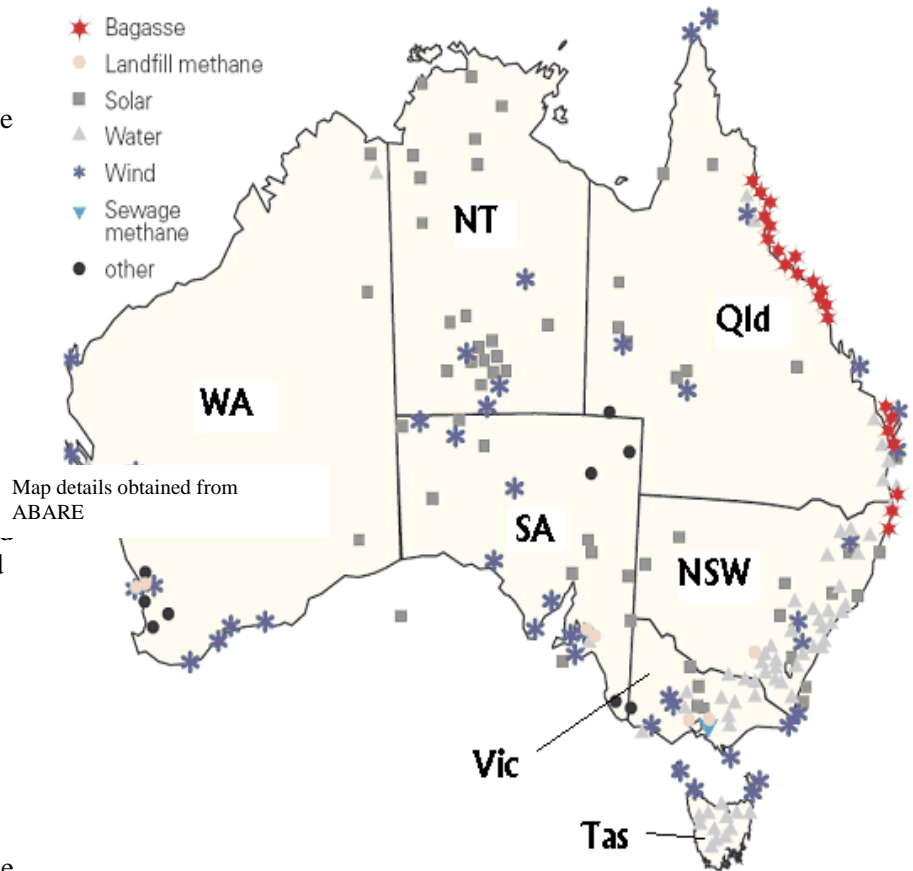
- Power generation is a large sector in Australia with around USD \$81 billion of investment in generation, transmission and distribution assets. Annual generation is around 232,000 GWh from 45GW of installed capacity.
- Historically much of Australia's generating capacity has been supplied by black and brown coal fired power stations located adjacent to Australian major coal deposits. These deposits were linked via a network of transmission lines forming the backbone of Australia's electricity grid.
- Early work on renewable energy was undertaken in 1914 by the government of Tasmania (Tas) through the building of a series of hydroelectric projects. These projects continue to be managed by Hydro Tasmania the largest supplier of renewable energy in Australia today.
- The building of the Snowy Mountain Hydro Scheme between 1949 and 1974 further increased Australian renewable energy capacity with significantly sized generating assets located in New South Wales (NSW).
- Following the completion of the Snowy Scheme there was a period of 20 years where little additional capacity was added to Australia's renewable energy generation.
- Most of the projects during this 20-year period tended to be small local generation projects designed to supply a particular industry or manufacturing location with power by combusting waste materials.
- One of the key barriers to the further development of the renewable energy industry was the low cost of non-renewable energy such as coal or gas fired generation.
- In 2000 the Australian government enacted the Renewable Energy (Electricity) Act 2000 to promote the development of renewable energy in Australia. This act requires generation of a Mandated Renewable Energy Target (MRET) of 9,500 gigawatt hours of extra renewable electricity per year by 2010.
- The Office of the Renewable Energy Regulator (ORER) is the agency responsible for ensuring that the above target is met, and has established a range of measures to promote renewable energy projects.
- The Australian Federal Government has further supported the renewable energy industry through the development of a number of government grants (USD \$150 million) for research and development activities to expand, enhance and promote renewable alternatives.

INDUSTRY STATISTICS:

- The split of renewable electricity generation technologies is best presented in the graphs below



- As the graphs above show electricity from renewable energy accounts for around 8% of the electricity consumed each year in Australia. Of this 8%, hydro represents the majority share (> 75%) of renewable energy generated coming from installed hydro power stations.
- The graph to the right from the Australian Bureau of Agricultural and Resource Economics (ABARE) shows the approximate locations of many of Australia's renewable generating sites.
- It highlights how many of the generating methods (i.e. hydro and wind) are concentrated in particular regional areas.
- Aside from electricity, renewable technologies are used to provide heat for industry and household needs. Traditional renewable sources for heating including wood waste and agricultural byproducts are being supplemented by other technologies including solar. One of the largest household renewable initiatives is the sale of solar hot water heaters for the home.



The following sections provide a basic outline of some of the renewable energy technologies being pursued in Australia at the present time.

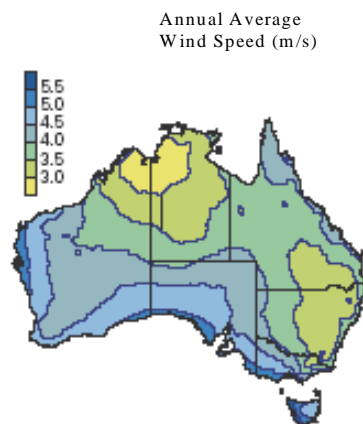
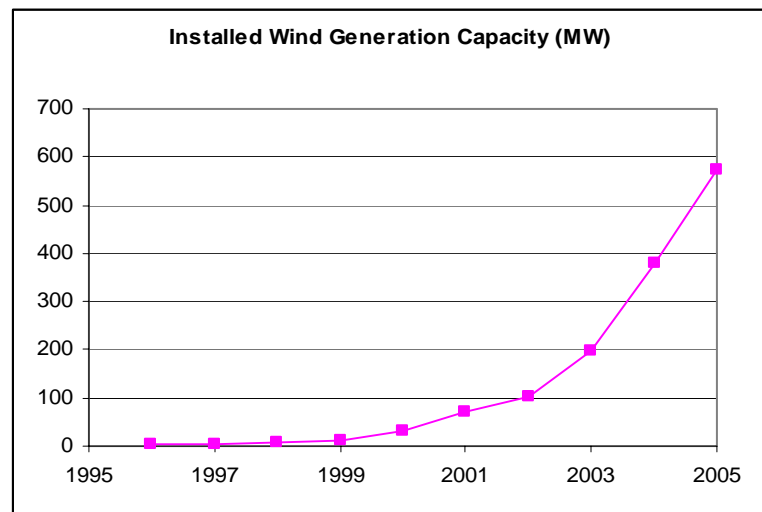
Hydro

As indicated in earlier sections hydro generated electricity is Australia's largest source of renewable energy. There is an estimated 7,500MW of installed generating capacity mainly in Tasmania and central New South Wales, as well as some sites in Victoria. Much of this capacity is concentrated in three companies - Snowy Hydro (3,750MW), Hydro Tasmania (2,270MW), Southern Hydro (510MW) and Tarong Energy (500MW), with the balance held by a number of companies owning mostly small generating (<10MW) sites.

There is significant reluctance in Australia to the construction of other large dams for the purposes of generating hydro electricity given the environmental and social impacts. Whilst several projects have been proposed in the last 10 to 20 years, they have been met with significant public opposition. The alternative use of mini and micro-hydro equipment in Australia is not particularly widespread. This is mainly due to the presence of the national grid offering relatively cheap electricity vs. the high capital costs of a hydro plant. In areas where the grid is not present the prevailing climatic conditions do not guarantee a regular supply of water.

Wind

Wind powered energy is one of the fastest growing areas of renewable energy in Australia, and has been helped significantly by the Australian Government's MRET program (see next section). To date there is around 572MW of installed capacity generating an estimated 1,800GWh of electricity annually. In 2005 Australia had around 30 wind farms with the largest having 91MW of capacity from 55 x 1.65MW turbines. Most of Australia's wind farms have been installed since 1997 and comprise groups of 0.6 to 1.8MW turbines. There are around 415 individual turbines installed on Australian wind farms.



The map to the left shows the locations most suitable for wind projects are located around Australia's southern coasts and along some of the western coast. Industry peak group AusWEA, estimates that there is a further 5,800MW of potential wind energy projects either in planning, feasibility or seeking planning approval.

While several factors are likely to influence the addition of wind generating capacity to the Australian electricity market, the most likely limiting factor is continuation of support for the industry through programs such as MRET. Wind power generation cost is currently around USD \$52.5/MWh vs. gas powered at USD \$36/MWh and coal at USD \$27/MWh. Whilst the average cost for wind is decreasing each year this still presents a significant cost disincentive without support. Wind energy is expected to be generation cost comparable in 2015.

To date Danish company Vestas has been very active in the market with around 250 of its turbines used on many of Australia's wind farms. The Vestas V66 is the most commonly used turbine, with 150 of these machines at the Toora, Woolnorth, Wattle Point and Lake Bonney Stage 1 wind farms. Aside from Vestas, equipment from Nordex (Denmark), NEG-Micon (now Vestas) and Enercon (Germany) are installed on Australian wind farms.

There is also a market for small wind turbines (<100kW) for incorporation in remote area power schemes (RAPS). These systems are often used to offset the need for diesel generators in areas not supplied by the national grid. It is estimated there are more than 1000 RAPS around Australia with many concentrated in Western Australia and central areas of Australia with highly dispersed communities.

Biomass

As indicated on the earlier graph, biomass is likely to be as important in terms of renewable electricity generation as wind energy in the future. Biomass also has the potential to be used as a heat source directly for particular industrial processes, suggesting its overall energy use is significantly greater than the energy generated by hydro plants in Australia.

There is a range of biomass technologies being used in Australia at the present time. The most common of these technologies is energy generated using bagasse (sugar cane waste) to provide energy for the sugar industry as well as electricity for the grid. With an estimated installed capacity of 336MW, biomass generates around 3.3PJ of electricity each year. Bagasse also generates large volumes of heat for sugar milling and processing estimated at close to 90 PJ/year (i.e. greater than the 60PJ of electricity generated by hydro). Most of this production is located in northern Queensland in Australia's sugar cane areas and is dominated (75% prod.) by 5 milling companies.

Biofuels are another area of growth and a number of groups in Australia are working on several initiatives including large-scale bio-diesel and ethanol manufacturing. The Australian government has set a target of 350ML by 2010, which considering Australia's current estimated production capacity of 25ML represents a significant challenge. One of the more likely feedstocks for this industry will be sugar cane from Queensland. Whilst there are a number of ethanol plants already established in Queensland, significant development of other sites will be required to meet the government's target of 350ML.

Australia has previously toyed with biofuels such as ethanol, including a 10% mix released to the public in 2002. There were significant problems with the implementation of these E10 fuels that has led to a lack of public confidence in the bio-fuel industry. The government is currently addressing these concerns as well as providing more controls to ensure quality of product and supply. Given Australia's significant fuel imports and reducing local refining capacity of traditional fuels, biofuels are likely to be more important moving ahead.

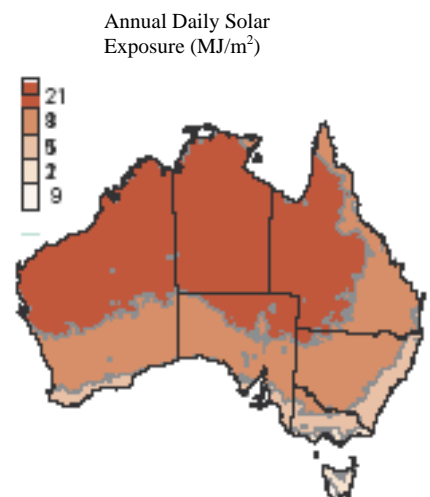
Other biomass technologies in Australia include biogas harvesting from landfills and waste treatment plants, much of which is consumed locally to provide energy for surrounding industries. Conversion of waste products from the agricultural and forestry sectors into replacement products for coal and oil is another fast growing segment in the biomass generating area.

Solar

The Australian climate and location is ideally suited to solar power. The picture to the right shows that much of Australia has very high levels of solar exposure. Cumulative installed photovoltaic (PV) electric power in Australia is around 52MW with 90% being off-grid. Much of this is incorporated into the RAPS sites discussed earlier. Overall, the PV market grew 27 per cent in 2002 and the grid-connected market alone grew 95 per cent (albeit from a very small base). Some 12,000 domestic residents in Australia currently have PV systems installed.

Australia has become a world leader in PV technology and has had intensive local research and manufacturing since 1975. Australia has around 1200 people employed in the PV industry and this is expected to grow to over 6000 by 2010.

Aside from PV technology development, Australia is heavily involved in the manufacture of solar water heaters (SWH). In 2004/05 around 61,000 units were sold domestically and a further 18,000 units exported. SWHs currently account for 8% of total water heater sales and have a value of USD \$80 million with USD \$24 million in exports. There are currently five national manufacturers of flat plate SWH systems. It is estimated that solar water heaters offset around 2.6PJ of heating energy, as such the manufacturers of these heaters have been able to use programs such as MRET to claim the benefits of the renewable energy they provide.



Geothermal

A recent addition to renewable energy prospects in Australia is the development of 'hot dry rock' technology. Hot dry rock technology involves pumping water underground to regions of the earth's crust, which are very hot or using hot brine from these regions. The heat - around 250°C - is then used in the generation of electricity. The technology requires large volumes of relatively homogeneous, high heat production granite with potential for enhanced permeability and with an overlying layer of sediment of optimal thickness for insulation. Conditions such as these are located in South Australia, where several Australian companies (Petratherm, Green Rock and Geodynamics Limited) are undertaking feasibility studies and trial generating plants.

AUSTRALIAN INDUSTRY PROGRAMS / GRANTS:

The following programs indicate the Australian government's level of commitment to pursuing renewable energy alternatives. Whilst many of these programs are targeting and assisting Australian companies, there is certainly room for collaborative efforts with international companies and organizations. Joint development of technology between international groups and an Australian partner may therefore qualify for some of these grants.

Mandated Renewable Energy Target (MRET)

As indicated earlier the renewable generation of electricity is often not cost comparable when non-renewable methods such as coal or gas fired plant is considered. To facilitate the development of the renewable energy industry in Australia, the Renewable Energy (Electricity) Act 2000 established the MRET aim that an additional 9,500 gigawatt hours of renewable electricity per year would be available by 2010. The target of 9,500 represents an estimated 2% of the energy required by Australia in 2010. The program creates Renewable Energy Certificates (RECs) which can be traded between generators of renewable energy and generators of non-renewable energy. Non-renewable generators need to purchase sufficient RECs to meet their commitments (i.e. 2% of their non-renewable generation) each year.

The program is overseen by the Office of the Renewable Energy Regulator (ORER) that awards RECs to companies generating via renewable means. Such means include solar, wind, hydro, wave & tidal, geothermal, biofuels, solar water heating, pump hydro, RAPS, co-firing with renewables and co-firing of certain waste products. Each REC is equivalent to 1MWh of renewable generation, which in August 2004 were trading between USD \$27 and \$30. Generators who do not meet their commitments are charged around USD \$30 for each REC they have not acquired. Additional information on MRET is available at – www.orer.gov.au

Other Federal Government Programs

Renewable Energy Development Initiative (REDI)

REDI is a competitive merit-based grant program supporting Renewable Energy innovation and its commercialization. It provides grant funding up to AUD\$100 million in competitive grants to Australian businesses over seven years. It offers grants of between AUD\$50,000 and \$5 million for research and development (R&D), proof-of-concept, and early-stage commercialization projects with high commercial and greenhouse gas abatement potential (taken from AusIndustry website)

Solar Cities

Solar Cities is a AUD\$75.3 million initiative to be implemented by the Department of the Environment and Heritage through trials in Adelaide and at least three other electricity grid-connected urban areas around Australia. Solar Cities is an innovative program, which is designed to demonstrate how solar power, smart meters, energy efficiency and new approaches to electricity pricing can combine to provide a sustainable energy future in urban locations throughout Australia. It is a partnership approach that involves all levels of Government, the private sector and the local community (taken from AusIndustry website).

Ethanol and Biodiesel Production Grants

The Government encourages the production of biofuels through the payment of production grants of AUD 38.143 cents per litre (cpl) for fuel ethanol. Production grants for fuel ethanol commenced from 18 September 2002 and were extended in March 2004 for a further eight years to 30 June 2011. In the 2003-04 Budget, the Government announced broadly similar treatment for biodiesel commencing from 18 September 2003. These arrangements ensure that the effective rate of excise for biofuels is zero until 1 July 2011.

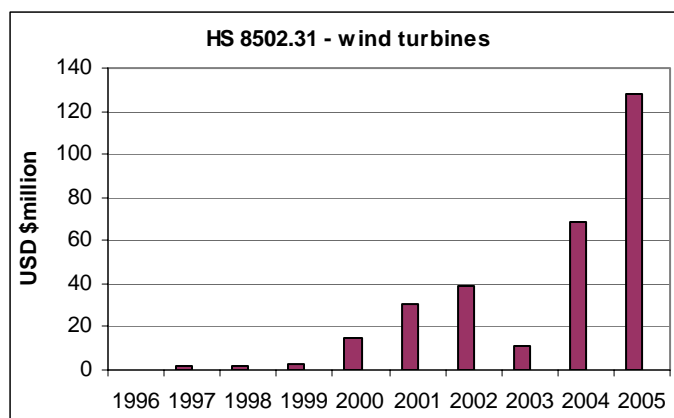
The Government announced on 25 July 2003 its intention to provide a capped amount of AUD \$37.6 million to fund one-off capital grants for projects that provide new or expanded biofuels production capacity. The Biofuels Capital Grants Program aims to increase the availability of biofuels for the domestic transport market. Grants have been provided at a rate of 16 cents per litre for new or expanded projects producing a minimum of 5 million litres of biofuel per annum. Grants were limited to a maximum of AUD \$10 million per project (taken from AusIndustry website).

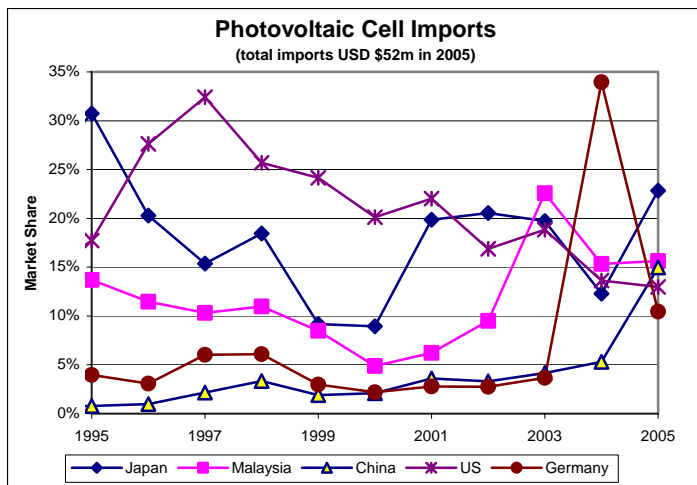
KEY INDUSTRY CONCERNS / DRIVERS:

- As indicated in previous sections one of the most pressing concerns for the ongoing development of this industry is the level of financial support going forward.
- At the present time (and for the short to medium term future) non-renewable generation will have a significant cost advantage over renewable alternatives. It is expected with ongoing industry development and technology advances that this cost gap will be reduced.
- International pressures for Australia to introduce a carbon-trading or similar scheme to further improve the economic parity between renewable and non-renewable have had little success. The Australian Federal Government, like the US, is not a signatory to Kyoto Protocol.
- Because Australia has chosen not to ratify the Kyoto Protocol, there is currently no international market that Australian companies can access for sale of emissions credits. A number of the Australian State Governments are involved in an inter-jurisdictional emissions trading working group to design a suitable national trading scheme. Such a scheme would have significant benefits for the local renewable industry.
- At the last Australian Federal election (October 2004), the Government indicated that it would not be increasing the previously set MRET target of 9,500. The opposition government indicated during this election that they would increase the MRET to 5% or around 24,000. While the next Federal election is scheduled for late 2007, it is not clear whether the opposition government would take a similar stance.

INDUSTRY COMPETITION & U.S. POSITION:

- To date one of the fastest growing segments in renewable energy has been the wind-powered generation.
- Current imports are estimated at USD \$128 million, which is evenly split between German and Danish imports, around USD \$60m each.
- A number of foreign manufacturers of wind turbine equipment have set up substantial operations in Australia including representative offices, sales & marketing teams and in some cases manufacturing centers.





- The graph to the left shows the top five countries exporting PV cells to Australia. These countries account for around 80% of PV cell imports.
- Unlike the wind turbine market European participation in PV cells has generally been quite low. Of greater influence have been Asian suppliers.
- Australia's PV cell production is increasing with production estimated at USD\$150 million in 2002.

- Details on the imports of other renewable technologies are particularly hard to gather given the relatively new nature of these industries and the import statistics collected. Technologies such as biogas and biomass generation are certainly growing as are the waste to energy systems, based upon our review of the increased level of public discussion/awareness.

BEST PROSPECTS:

- Suppliers to solar cell manufacturers – Australia is building a number of solar cell factories
- Solar energy equipment, particularly for isolated communities
- Wind turbines – market exist for small scale (<200kW) up to large scale (>2MW) generation
- Energy storage technology for intermittent generation
- Geothermal generation technology for low temperature (~250° C) sources
- Biomass generating technology including waste to energy and bio-fuel manufacturing

MARKET ACCESS:

- There are no quota limits on the import of renewable energy equipment into Australia
- Currently tariffs on this kind of equipment are at 0% as a result of the U.S. / Australia FTA that came into force on 1 January 2005
- Australia has a goods and services tax of 10% on all equipment inclusive of landed costs and fees that might be payable.

MARKET ENTRY:

We recommend that U.S. businesses seeking opportunities in the renewable energy industry undertake some research before considering entry to the Australian market. While this is an exciting growth area with significant opportunities there are a number of local and international competitors. By way of example the wind energy segment, which has increasing import volumes for the past 8 years, has recently had several internationally sponsored local manufacturing facilities established to service local demands. Obtaining up to date intelligence on market dynamics (e.g. pricing, competition, local production, etc) is important, given the fast developing nature of the industry and the continuing introduction of new technologies.

As such the industry is very receptive to advances in technology and has some substantial R&D efforts going on. This presents other opportunities for entry via a collaborative research or partnering approach with a local company. As indicated in earlier sections there are R&D funds available to Australian companies and their partners for performing late stage R&D or market introduction trials.

For those US companies with well-established products, finding an Australian distributor or sales agent is probably more economic than setting up operations. This is particularly relevant given the nature of future industry support and the fast changing nature of the renewable generation market. As with some segments of the renewable industry (i.e. bagasse) the market in Australia may be concentrated to a particular area of region. The Commercial Service is able to provide assistance in locating distributors through our partner searches.

OPPORTUNITIES FOR PROFILE BUILDING/UPCOMING TRADE EVENTS:

- **Sustainable Energy 2006** – Brisbane, May 3-4, 2006. This annual conference is the key meeting for those involved in Australia's renewable energy industry. <http://www.bcse.org.au/default.asp?id=50&articleid=311>
- **Global Wind Power 2006** – Adelaide, September 18-21, 2006. This conference is the world's premier wind energy industry event in the region and provides a unique forum for speakers to meet, share information and exhibit products. <http://www.auswea.com.au/global06/index.html>

OTHER RESOURCES:

- Australian Bureau of Agricultural and Resource Economics – www.abare.org.au
- Australian Greenhouse Office, Department of the Environment and Heritage- www.greenhouse.gov.au
- Australian Wind Energy Association – www.auswea.com.au
- Business Council for Sustainable Energy – www.bcse.org.au
- Office of the Renewable Energy Regulator - www.orer.gov.au

CONTACT US:

If you would like to discuss the promotion and market entry of your renewable energy technology or solution into the Australian market, the Commercial Service is ready to assist you. Please contact John McCaffrey, Commercial Specialist responsible for the energy sector at: john.mccaffrey@mail.doc.gov. In addition, please visit our website to discover latest commercial developments in the Australian energy market: www.buyusa.gov/australia

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